

# Special Right Triangles

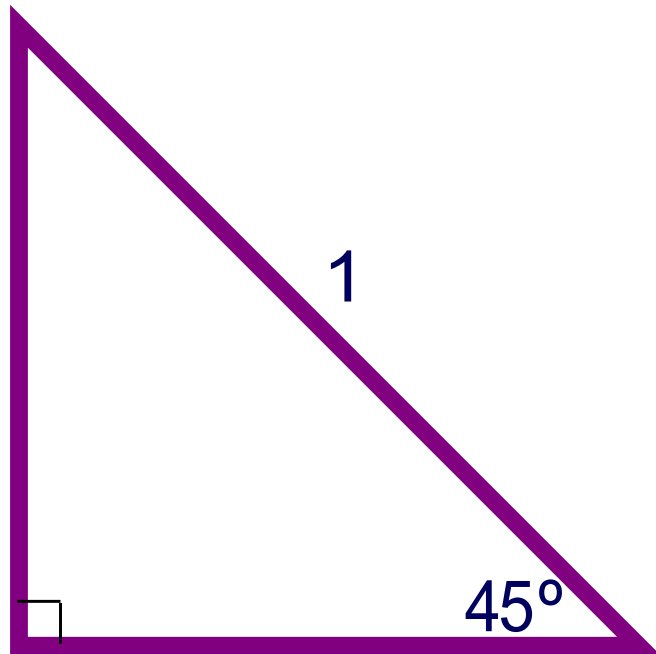
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# Trig Values of Special Angles

Recall in geometry the study of special cases of right triangles such as 30-60-90 and 45-45-90. The angles associated with these triangles occur frequently in trig, and so it is important to learn and remember the exact values of these functions.

Exact values are  $\frac{\sqrt{3}}{2}$  and  $\frac{\sqrt{2}}{2}$ , as opposed to approximate values .8660 and .7071.)

# Evaluating Trig Functions of $45^\circ$

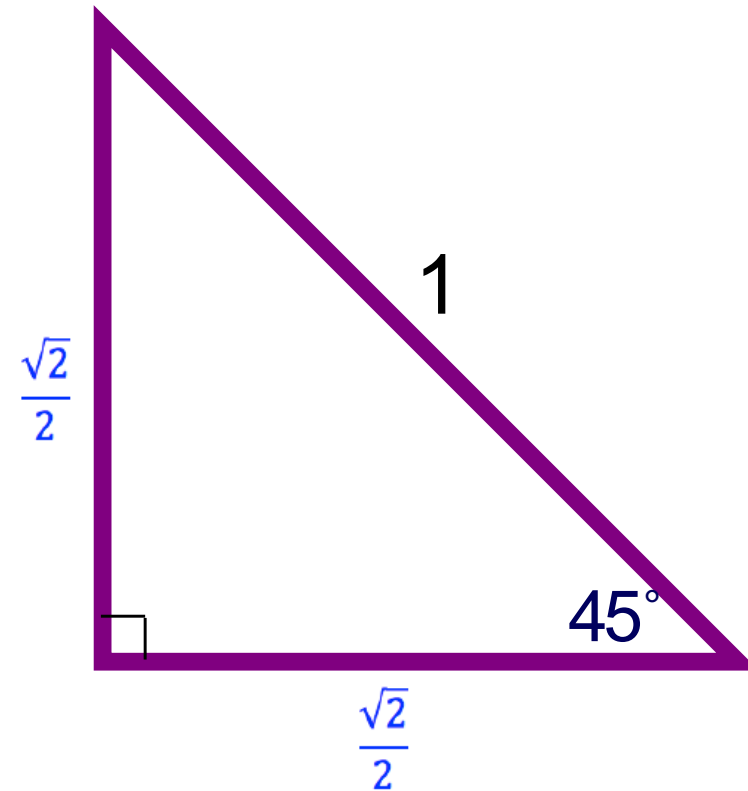


Given a right triangle with one acute angle of  $45^\circ$  and hypotenuse length 1. Complete the triangle by giving the other angle and side lengths. Then find the values of each trig function.

(solution on next slide)

# Evaluating Trig Functions of $45^\circ$

The other angle is also  $45^\circ$ .  
Because the acute angles are congruent, the legs are congruent. Let  $x$  represent the length of the legs.



$$x^2 + x^2 = 1^2$$

$$2x^2 = 1$$

$$x^2 = \frac{1}{2}$$

$$x = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\sin 45^\circ = \frac{\sqrt{2}}{2}$$

$$\cos 45^\circ = \frac{\sqrt{2}}{2}$$

$$\tan 45^\circ = 1$$

$$\csc 45^\circ = \sqrt{2}$$

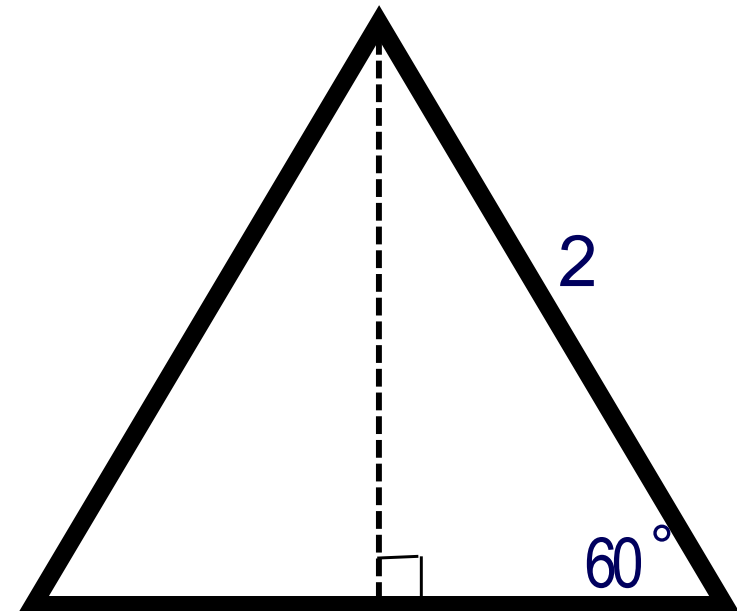
$$\sec 45^\circ = \sqrt{2}$$

$$\cot 45^\circ = 1$$

# Evaluating Trig Functions of $30^\circ$ and $60^\circ$

Given an equilateral triangle with side length 2. Complete the triangle by giving the other angle and side lengths. Then complete the trig values below.

Hint: Recall that the altitude bisects the base. So the length of half of the base is 1.



$$\sin 60^\circ =$$

$$\cos 60^\circ =$$

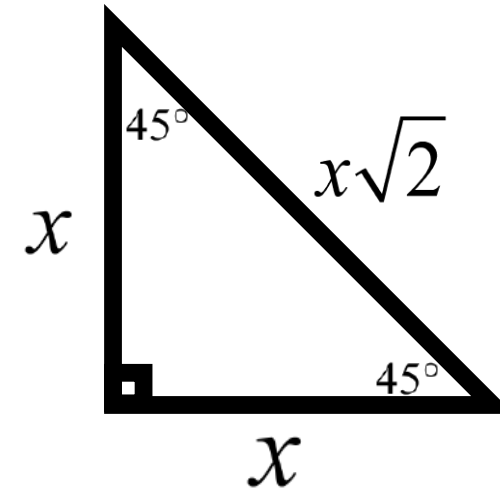
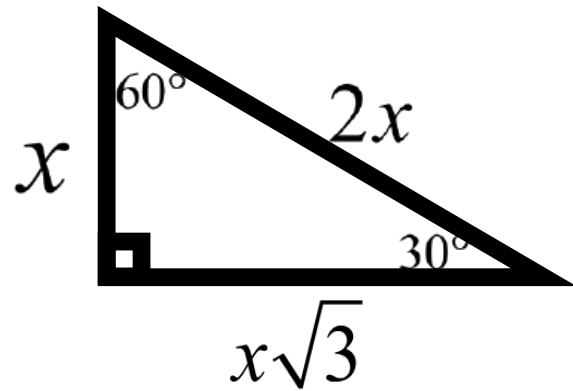
$$\tan 60^\circ =$$

$$\sin 30^\circ =$$

$$\cos 30^\circ =$$

$$\tan 30^\circ =$$

# Special Right Triangles

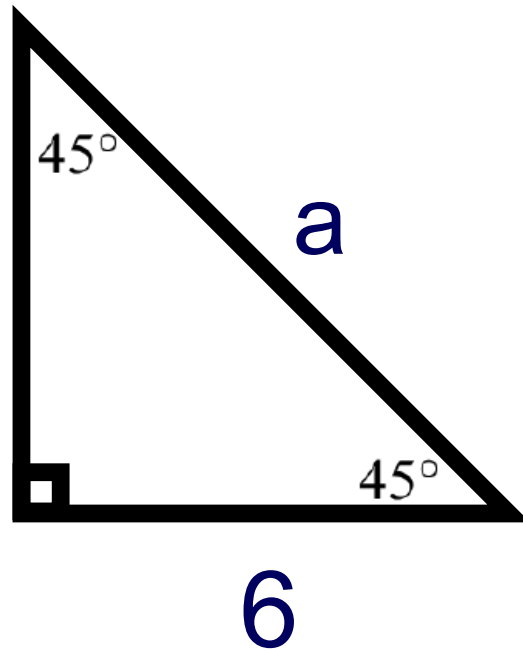


$$\begin{aligned}\cos(30^\circ) &= \frac{\sqrt{3}}{2} & \cos(60^\circ) &= \frac{1}{2} \\ \sin(30^\circ) &= \frac{1}{2} & \sin(60^\circ) &= \frac{\sqrt{3}}{2} \\ \tan(30^\circ) &= \frac{\sqrt{3}}{3} & \tan(60^\circ) &= \sqrt{3}\end{aligned}$$

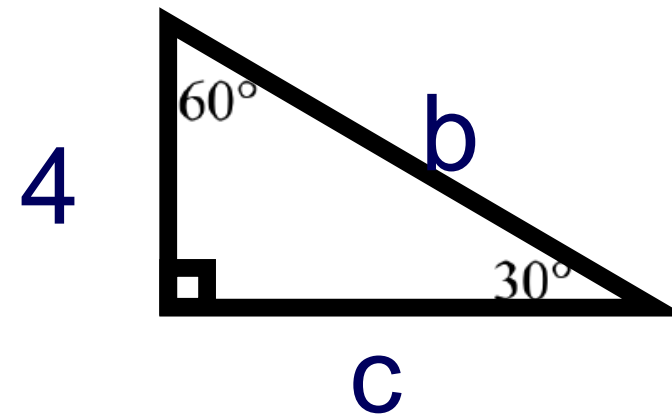
$$\begin{aligned}\cos(45^\circ) &= \frac{\sqrt{2}}{2} \\ \sin(45^\circ) &= \frac{\sqrt{2}}{2} \\ \tan(45^\circ) &= 1\end{aligned}$$

# Special Right Triangles

Example 1: Find the value of  $a$ .



Example 2: Find the values of  $b$  &  $c$ .



Answer

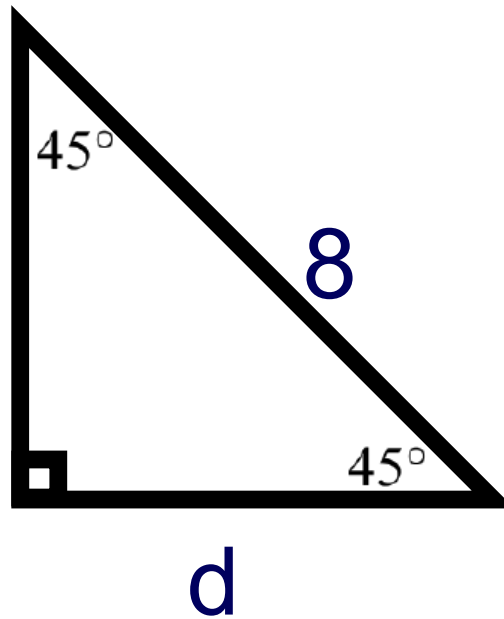
19 What is the value of  $d$ ?

A 4

B  $8\sqrt{2}$

C  $4\sqrt{2}$

D  $\frac{8}{\sqrt{2}}$



Answer



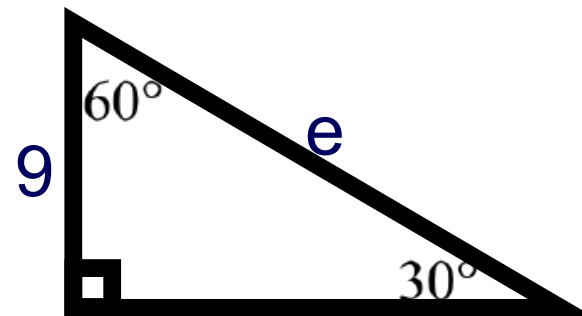
20 What is the value of  $e$ ?

A 18

B  $9\sqrt{3}$

C  $\frac{9}{\sqrt{3}}$

D 4.5



Answer

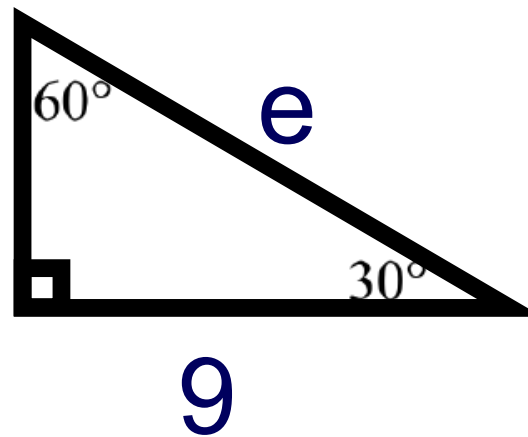
21 What is the value of  $e$ ?

A  $9\sqrt{3}$

B  $3\sqrt{3}$

C 18

D  $6\sqrt{3}$



Answer

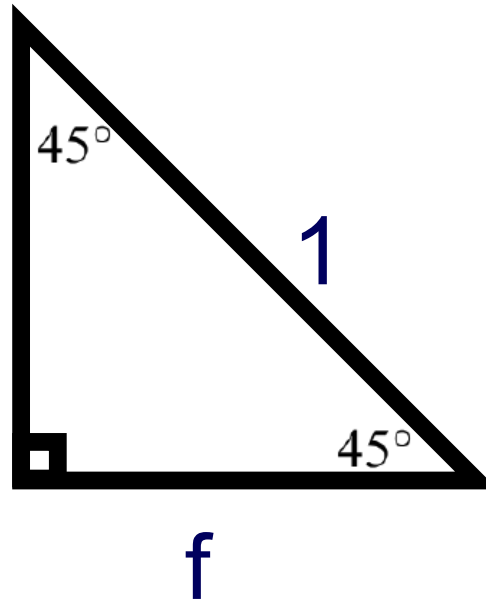
22 In simplest form, what is the value of  $f$ ?

A 0.5

B 1

C  $\frac{\sqrt{2}}{2}$

D  $\frac{1}{\sqrt{2}}$



Answer

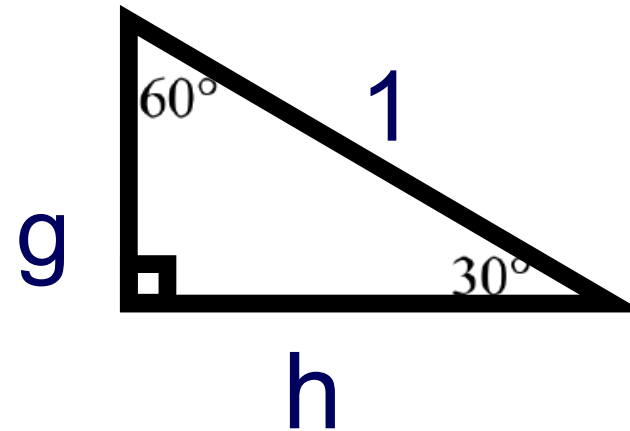
23 What are the values of  $g$  and  $h$ ?

A  $g = 0.5$  and  $h = \frac{\sqrt{3}}{2}$

B  $g = \frac{\sqrt{3}}{2}$  and  $h = 0.5$

C  $g = \frac{\sqrt{2}}{2}$  and  $h = 0.5$

D  $g = 0.5$  and  $h = \frac{\sqrt{2}}{2}$



Answer